

The astrometric Gaia-FUN-SSO observation campaign of 99942 Apophis

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Abstract

© 2015 ESO. Aims. Astrometric observations performed by the Gaia Follow-Up Network for Solar System Objects (Gaia-FUN-SSO) play a key role in ensuring that moving objects first detected by ESA's Gaia mission remain recoverable after their discovery. An observation campaign on the potentially hazardous asteroid (99 942) Apophis was conducted during the asteroid's latest period of visibility, from 12/21/2012 to 5/2/2013, to test the coordination and evaluate the overall performance of the Gaia-FUN-SSO. Methods. The 2732 high quality astrometric observations acquired during the Gaia-FUN-SSO campaign were reduced with the Platform for Reduction of Astronomical Images Automatically (PRAIA), using the USNO CCD Astrograph Catalogue 4 (UCAC4) as a reference. The astrometric reduction process and the precision of the newly obtained measurements are discussed. We compare the residuals of astrometric observations that we obtained using this reduction process to data sets that were individually reduced by observers and accepted by the Minor Planet Center. Results. We obtained 2103 previously unpublished astrometric positions and provide these to the scientific community. Using these data we show that our reduction of this astrometric campaign with a reliable stellar catalog substantially improves the quality of the astrometric results. We present evidence that the new data will help to reduce the orbit uncertainty of Apophis during its close approach in 2029. We show that uncertainties due to geolocations of observing stations, as well as rounding of astrometric data can introduce an unnecessary degradation in the quality of the resulting astrometric positions. Finally, we discuss the impact of our campaign reduction on the recovery process of newly discovered asteroids.

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Keywords

Astrometry, Ephemerides, Minor planets, asteroids: individual: 99 942 Apophis